1	**Answers/Indicative content**	**Level of Response**	8
	This question to be marked as a Level of Response. Answers may make reference to e.g.: ***Photo-realism***: bitmaps are comprised of small pixels so the bitmap is the most suitable format for photo-realistic images or images with high amounts of fine detail. The vector image, on the other hand, does not possess the same kinds of photo-realistic capabilities because it is comprised of larger objects and cannot achieve the kind of fine detail that is necessary for photo-realism. ***Scalability:*** vector images are made of mathematically defined objects so sizes can be easily manipulated with little to no loss in the quality of the image. The objects within a vector image are re-rendered at a greater or smaller scale to provide consistently smooth edges. Bitmaps are more difficult to scale because changing the size of a bitmap requires a complete rearrangement of the pixels. An enlarged bitmap is likely to appear blurry, or "pixelated," meaning that the different pixels of the image have become visible. ***Shape:*** a bitmap image always has four straight edges while vector images can be any shape.	**Level 3 (7–8 marks)** Candidates will evaluate in detail the suitability of both bitmap and vector graphics for use on the website. The information will be relevant, clear, organised and presented in a structured and coherent format. There will be a reasoned conclusion/opinion. Subject specific terminology will be used accurately and appropriately. **Level 2 (4–6 marks)** Candidates will explain the suitability of both bitmap and vector graphics for use on the website. For the most part, the information will be relevant and presented in a structured and coherent format. There may be a reasoned conclusion/opinion. Subject specific terminology will be used appropriately and for the most part correctly. **Level 1 (1–3 marks)** Candidates will describe the suitability of bitmap and/or vector graphics for use on the website. Answers may be in the form of a list. There will be little or no use of specialist terms. **Zero marks:** Response with no valid content	

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	Answers/Indicative content	Level of Response	
	File size: complex vector images can have a very large file size due to the complex instructions needed to create them; the size of the file is not dependant on the size of the image: small complex images can have a large file size; bitmap images can be large but can be compressed. ***Conversion between file types***: the most common file type for bitmap web images are jpeg or gif, and conversion to these is simple without loss of quality; conversion of vector images often results in more loss of quality.		

2	***Four*** *from:* PNG images are lossless/do not lose data when edited so have higher quality JPEG (jpg) format is compressed with data being lost/data is lost during editing but images are of lower quality/have artefacts compared to PNG images GIF only allows limited number of colours/256 colours so is not suitable for high quality image publication GIF allows several images in one file so animations are possible, but this is not required.	**4**

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3	***Eight** from:* Create new canvas/image on which to compose the final image of the snail Copy and paste/scan all components into the new canvas so that they are ready for editing Ensure that all backgrounds of all shapes are set to transparent to allow overlap of components Shape 1 has part of the image cut out/erased to produce the eye shape Shape 1 is copied and pasted to produce two images for the eyes of the snail Shape 2 is inverted/flipped horizontally (across the vertical plane) and resized larger/enlarged for the shell Shape 3 is rotated by 90 degrees and inverted horizontally to form one of the antennae ...resulting shape is copied and pasted and stretched horizontally to form the second antenna Shape 4 is resized, filled with black to form the body of the snail All the shapes are positioned/aligned together/grouped to form the composite cartoon snail Brush tool with pencil/small size is used to ensure that the join between shape 2/shell and shape 3/body is complete/no gaps are left ...used to add dotted line at base of shell/shape 2 Text is added and rotated left by 90/right by 270 degrees ...text is positioned as shown Components are grouped and resized together to form final image.	8

4	***Six** from e.g.:* Cropping of images to remove unwanted areas... ...use of rule of thirds to keep image visual balance ...can lose important detail if poorly used Colour balance adjustment to change 'feel' of image... ...whiter to create warm mood ...bluer to create cooler mood/feel ...restore natural colour to flesh tones Brightness/contrast changes to change appearance of image ...increase in contrast for photos taken on dull days can show more detail ...decrease in contrast for photos taken in bright sun can increase detail in shadows Add a new/missing object/replacing an object in the image ...combining elements of different photos to create a new photo... ...covering/obscuring part of the image with another object Creating a digital illustration/cartoon of the original photo Changing/adding a different/new/fantasy/magical background Create an illusion of depth Create special effects Adjusting the image itself ...change the transparency of an image ...resizing of photos ...reducing noise in the image ..correcting lens distortion/perspective.	6

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5	*Four from:* Can be saved/stored in a variety of formats so that the webpage can be viewed on all computer platforms Can be output from many applications so easy to produce Can be created from the pixel arrays in memory Can display vast range of colours depending on bits per pixel Can display subtle gradations of shades/colour/greyscales as it is made of pixels Best for photo-realism/continuous tones compared to vector images so images of advertised items appear more realistic Individual pixels can be modified to customise/edit the image so images of advertised items are more appealing/attractive Can translate easily to dot-format output for use with CRTs/printers Can be used in simple animations e.g. Animated gifs Can be compressed so that file size is reduced and loads faster.	4

6	**Six** *from:* Information about what is to be drawn/instruction to draw circles/use of (Bezier) curves to draw shape Location of the centre point of the (outer/larger) circle at 400,300 Radius of the (outer/larger) circle as 200 pixels Location of the inner/smaller circle at 500, 300 Radius of the inner/smaller circle as 100 pixels Style/weight of the lines to be drawn Colour(s) of the circle fill(s) Degree of opacity/transparency of the circles.	6

7(a)	**Four** *from:* Made up of pixels Each pixel is represented by bits 1 to 64 bits per pixel Number of pixels depending on colour depth Bits representing pixels packed in rows for bmp Rows rounded to 32 bit words Padding needed for loading into memory locations Usually stored from bottom left up to top right of image.	4
(b)	**Four** *from:* Vector images are stored as co-ordinates/geometric descriptions of shapes and colours Digital monitors cannot display co-ordinate-based graphics Because all digital monitors are pixel-based Graphics card/computer must convert the co-ordinates/ descriptions into pixels before sending to digital monitor... Uses an ADC-type action Resizes the image to suit the requirements of the user/monitor.	4

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8	**Six** *from:* Fig. 2 can be scaled/zoomed without loss of quality/clarity Because it is (a vector graphic) made up of instructions/code on how to create the letter When resized/zoomed the graphic is recalculated so no loss of quality Fig. 1 cannot be scaled/zoomed without loss of quality/clarity Because it is (a bitmap image) made of square pixels The rounded appearance is created by pixels of varying density If zoomed/enlarged too much then pixels are visible If zoomed the letter becomes blurred/lacks definition/unreadable.	

9(a)	**Two** *from:* Crop tool to remove excess background/to show just the face Border line added to the whole image Resize tool to make image larger Saved as compressed (JPEG) format.	
(b)	**Six** *from:* The image in Fig. 1 has been created/saved as a bitmap Bitmaps are made of pixels The image in Fig. 2 has been saved as a compressed image with too much compression Loss of pixel/data during compression so detail is lost in the image of the face The compression artefacts are visible to the human eye The pixels in Fig. 2 are no longer small enough to be indistinguishable by the human eye When enlarged the pixels of the face/image become visible The face now looks unrealistic/blocky so the features are not distinguishable.	

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10(a)	**One** *from:* Level at which an object/file is placed in an image Represents part of a graphic/image as pixels (in a bitmap).	**1**
(b)	**Four** *from*: Can have transparency to allow other layers to show through/be seen Can be overlapped to create a composite image Can be replicated to show multiple instances of same image/object Can be replicated to hide/mask parts of an image Can be used to adjust the brightness/saturation of other layers.	**4**
(c)	*Command word: Discuss: give important arguments for and against. Often requires a conclusion.* **Eight** *from e.g.:* Editing can enhance attractiveness/look/appearance of items/models Editing can attract attention of viewer to compensate for reduction in attention span in recent years Editing can make poor photos appear neat/presentable to clients/customers to increase sales Less expensive than taking exact/precise/perfect photographs Removing blemishes, wrinkles, flabby parts/altering body shape is flattering to the model/clothes A false/unrealistic body image can be created Viewing of only perfection in clothes/models can lower viewers self-esteem ...cause eating disorders ...cause unnecessary pressure to confirm to unrealistic ideals Editing can be time consuming /tedious and slow down production.	**8**

11	**Six** *from e.g.:* Some graphics software may not support all file types so different export options allows images to be shared e.g. use of JPEG / GIF is almost universal Images can be saved as compressed images / files to save storage space / allow use in various scenarios / situations e.g. use of JPEG allows compression by various amounts but the more compression the lower the quality GIF allows areas to be made transparent whereas JPEG does not support this Different file types support different colour depths for use in various situations e.g. JPEG supports more colours than GIF Quality of the image is affected by choice of filetype e.g. TIFF retains better quality than JPEG / GIF when compressed Bitmap (BMP) files restrict the use of the images to e.g. Windows OS so availability of other types allows cross-platform use.	**6**

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12	**Six** *from e.g.:* Altered images can dissuade from / reinforce a belief of the viewer Adding people to images can persuade the viewer that the person was present when in fact they were not Removing people from photographs can create the belief that the person did not participate in an event Removing disgraced / out of favour people from photographs can create the belief that the person did not exist Retouching images of politicians can make them appear more attractive than in real life so more likely to appeal to a voter Viewers can be unaware that an image has been manipulated so may make decisions based on false information.	6

13	**Two** *from:* Perspective / transformation tool has been used (to correct perspective) by 'stretching' the image across the top to align the sides of the stores / shops / buildings Rotate right tool used to correct the image to an upright store / shop / building front Curtains (in left windows) have been inserted by copy / paste / clone pixel tools using those in right-hand set of windows as source Image has been cropped to remove some of the building Image has been resized to improve aspect ratio.	2

14(a)	**Two** *from:* Opacity from completely opaque to totally transparent Fade (actual) colour from one colour into another colour / white across the colour palette.	2
(b)	**Four** *from e.g.* Linear fills evenly across the image Radial fills with single line paths where the fill starts at centre and fills outwards along all radii ...fills evenly along all radii Elliptical fills with two line paths where fill starts at centre and fills outwards along two directions away from the centre ...can be skewed along one line or the other Conical fills create the illusion that the image is a cone shape Square fills can produce a star-like view in the colour Three colour fills merge from one colour into two others across the image Four colour fills merge from one colour into three others across the image.	4

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15	*Six from:* Photographs opened in image editor Person image cut out from photograph 1/Fig. 10.1 Mask around person is created to cover background Selection to be cut is highlighted/drawn Selection is modified around edges to ensure accuracy Using of adjustable nib for drawing tool Cut unwanted parts of image of woman Background of cut image changed to transparent Copy cut out (to clipboard) Create new layer for image of woman Import/paste cut out into image of office/photograph of office/Fig. 10.2 Place new image in correct position Resize image of woman (as required to fit in image of office) Bring to front/back as necessary Flatten/merge layers (if required) Correct new image for overlap/misplaced parts/pixels of imported image Crop area of new image/photograph 2 as required.	6

16(a)	**Two** *from:* Control point for lines/paths in image Has defined positions on the *x*- and *y*- axes Determines direction/vector of path Defines/shows the start and end points of lines/arcs/paths.	2
(b)	**Four** *from:* (Unrelated) nodes can be joined together Nodes can be moved to change the shape/path direction Add a new node(s) to change overall shape/add new path Delete a node to change overall shape/delete path Use of symmetrical nodes to create smooth, flowing curves on either side of a node. Use of asymmetrical nodes to obtain a different amount of curve on each side of the node (keeping a smooth flow through the node) Adjusting the length of each control arm without changing the direction Use of cusp nodes to create extreme changes in direction Adjusting the length and direction of each control arm independently Use of smooth nodes to create smooth transitions between straight/curved line segments	4

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17	**Eight** *from:* *Removal of 'Private barrier'/structure:* Freehand selection tool(s) to select irregular objects/barrier structure elements Cut tool to remove object from the image Colour picker tool to select background colour next to/behind barrier Paint(brush) tool to fill in area where barrier removed/paint over barrier structure ... using selected colour to match backgrounds/blend with backgrounds where barrier was Use a tool which allows cloning to fill pixels that were removed/use of clone tool/select and copy and paste to disguise where shadow of barrier was on path *Addition of new lamp post:* Freehand select tool to draw around existing lamp post/select lamp post Copy/paste tools to copy lamp post to clipboard (leaving existing in place) Create new layer for additional lamp post/paste new lamp post into layer/image Position new lamp post to precise position required *Clean up pasted image:* Colour picker tool to select colour to be painted into edges of added image and paint tool used to fill pixels around image to make it 'blend' in Use of appropriate brush size *Adding text for title:* Create new layers for text and path Type text and create/draw path for the text Use text to path to create shaped text Position text/title Remove temporary layers used to construct title *Finalising image:* Merge layers (down) to 'flatten' image.	

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18(a)	*One from:* Used as outline fonts to describe printable characters/glyphs Used as scalable graphics/svg in HTML5 on web pages Used by pen plotters to draw shapes on paper.	1
(b)	*Six from:* Vector images use mathematical descriptions/expressions of shapes to create images Shapes include lines/polygons/curves/ellipses Points defined with x-y axes and direction of path Shapes and positions are recalculated every time the image is resized so quality is retained Bitmap images consist of a set number of pixels When the bitmap is resized, pixels are added/removed/the number of pixels changes so the quality is altered Lines in vector images do not get thinner/thicker proportionately when resized but those in bitmaps do so quality of bitmaps changes.	6

19	*Six from e.g.:* Adding visual special effects/computer-generated imagery (CGI) to video sequences allows for creation of images that cannot exist in reality/enhance the entertainment value Colourising monochrome/black and white film stock to increase acceptability to audiences/sales of old films Images can be improved/changed by altering colours/shades/hues to influence viewers Images can be altered to remove/include objects/people not in original scene to influence/mislead viewers Images of impossible objects/situations can be created Altering photographic images to enhance sales of products can mislead buyers Altering photographic images to people to enhance appearance can mislead fans. *Must be at least 1 of each for full marks.*	6

20	*Six from:* Lossless compression retains data/pixels. Lossy removes data/pixels. Lossless/lossy compression reduces the file size. Lossless compression (usually) results in larger file size than lossy compression. Lossless compression avoids accumulated stages of re-compression/compression artefacts when editing images. Lossless compression allows editing to be (more easily) reversed whereas lossy does not. Lossless compression keeps original uncompressed image appearance whereas lossy can alter (perceived) appearance. Lossy compression can use variable compression. Saving/storing the file as in a compressed file format/jpeg.	6

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21	**Eight** *from*: **Four** *from:* Bitmap image files consist of data about the pixels and metadata Pixel data consists of number of pixels/colour depth Metadata consists of data about other data e.g. data about image source/copyright File format may allow compression Compression may be lossless/description of lossless compression …or lossy/description of lossy compression …be variable depending on user settings **Four** *from:* *Advantages/disadvantages of different bitmap file formats from:* *e.g.:* *JPEG* Allows both lossy and lossless compression to be used Widely supported by web browsers Suffers image degradation/artefact when repeatedly edited and saved Requires more processing power than some other formats due to compression techniques Does not (easily) support transparency Does not encode large uniform areas of colour well *PNG* Free/open source so can be used by anyone without recrimination Supports transparency Works well in web browsers Performs well with large uniform colour areas Works well when streamed/progressively downloaded *BMP* File sizes can be large Widely acceptable to Microsoft Windows applications *GIF* Supported by web browsers Supports animation Does not support colour management across different devices so colours may alter Only support up to 256 colours *TIFF* Can store 24-bit colour by using up to 48 bits per colour Uses lossless compression/LZW compression for no data loss Not widely supported by web browsers File sizes can be large Does not support interlacing Does not support animation.	8

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22	*Analyse: explain the main points or effectiveness in detail, identify their main characteristics, examine closely.* **Six** from: *Max two from:* Bitmaps are made up of pixels Bitmap files are created from existing pixel data stored in an array in memory Thumbnails contain links to larger versions of same file/image memory Thumbnails are smaller versions (of same image so they display quickly) *Max six from:* Pixel values may be modified individually/large groups by software tools so can be quicker/easier/more effective than modifying small parts of vector images Photographic quality/range of contrast/brightness is achieved by increasing the data about each pixel/number of pixels whereas with vector images whole areas must be altered Files can be reduced in size using data compression methods allowing more to be stored on a device but this reduces/can reduce quality of image Bitmap files translate well/easily to dot-format/raster-based output devices/CRTs/printers Files can be very large especially if the image contains a large number of colours so take along time to display/download/need progressive display techniques so viewer can see them quickly Data compression/decompression can introduce artefacts that 'spoil' the photographs Data compression/decompression can slow down the reading/rendering process and delay any display Bitmaps do not scale without the introduction of artefacts/pixellation/loss of data/resolution so can spoil the image Bitmaps can support transparency so can be used on any background. *Must be a proper analysis to obtain full marks.* *Must have expansions to be a proper analysis.* *Max 4 marks if bullets/list of points.*	6

23	**Four** from: Uses forward mapping of pixels from one image into next Pixels from start image/sad face mapped to new position in final image/smiling face Setting of control points in start image to map exactly to points in final image Pixels in start image mapped to points in final image that are determined by 'weighting'/Gaussian function in software Pixels next to control point move more than those further away/less than control points Pixels further away from control point are less affected by software algorithm so move less.	4

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24	**Eight** from: *Advantages:* Images/graphics can be scaled without loss of quality for use on different devices/screen sizes Images/graphics support transparency Image/graphic file sizes can be/are much less than bitmap files sizes especially for large images so disk storage/server space is reduced Image/graphic file sizes can be/are much less than bitmap files size so downloading times are reduced No need for multiple versions of image/graphic at different resolutions/less pixelation Lines/edges of objects in Images/graphics are well-defined at all resolutions Can be modified/altered more easily that bitmap graphics *Disadvantages:* Image/graphic files are less easily used to store extremely complex images/photographs Image/graphic files are less easily used for images with colour gradients Image/graphic images can vary in appearance depending on application/browser used to display Image/graphic images have to be converted to raster/bitmap for display on computer screens. *Must be at least 2 of each for full marks.* *Must be a proper evaluation for full marks.* *Max 6 marks if bullets/list of points.*	8
25	*Command word: Analyse: examine in detail to show meaning, identify elements and the relationship between them.* Max **two** from: Resolution is measured/described as pixels per inch/ppi Low resolution images have few pixels while high resolutions have many High resolution mages have higher quality/look clearer/crisper/sharper Max **eight** from: Resolution needs to be high/600ppi for (high-end/professional) printing to produce high quality images on paper/hardcopy/for magazines/publications Photographic images in magazines should be at least 300ppi for acceptable quality Poster images on advertising boards/bill boards can be as low as 150ppi even if large format as they are viewed from a distance Images designed for viewing on screen have resolutions that relate to the monitor in use Images designed to go on web pages are/were (usually) low resolution for speed of loading… …but need to be of high enough quality for viewing so a compromise has to be made Images designed for use in presentations should have a resolution suitable for projectors/large TV screens so images of, for example, 1024x768 with 72ppi are required The most common resolution for web pages is 72ppi but modern screens/monitors/retina screens are now (far) in excess of 100ppi so images for web pages need to be higher resolution Web images use pixel dimensions rather than resolution so images can have differing resolutions but display at same size and look the same.	8

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26	*Command word: Compare: identify/comment on similarities and/or differences.* **Six** from: RGB is Red, Green, Blue and CMYK is Cyan, Magenta, Yellow, Key/Black *Similarities:* Both are colour codes for defining colours Both can produce a range of colours from white through to black Both are supported by most graphic editing packages Both are affected by differences in the display media/require monitor and paper adjustments to produce the best quality output *Differences:* RGB uses additive colours to create the range of colours whereas CMYK uses subtractive colours Adding all three colours in RGB produces white Adding all colours in CMYK produces black Black has to be added in CMYK because CMY produces a 'muddy' brown/black/not true black ...a black cartridge is required in most inkjet printers to produce pure black on paper RGB is used for computer/screen/TV display screen whereas CMYK is used for printing **Must be at least one similarity and one difference for full marks.**	6

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27(a)	**Four** from: Format is open-source/royalty-free so can be used without seeking permission of owner/creator/anyone/W3C (World Wide Web Consortium) Format is text-based/based on XML which is (now) standard for use on web pages so can easily be used by companies Format can (easily) be imported into many graphics manipulation software so is transferable between computer platforms/applications Format is scripting so can be included/used with CCS/scripting/animations so works well on web pages/sites Format is supported by web/print systems/mobile devices so no need to convert which might produce differences in appearance No compression is applied to the image so no compromising of the image quality occurs Use of XML/text/instructions/mathematical calculations means that image can be scaled/resize/zoom without change/loss of quality.	**4**
(b)	**Four** from: The shape(s) that is/are to be drawn The dimensions of the shape to be drawn The dimensions/parameters of the lines to be drawn The style of the lines to be used The position on screen of the shape The colours to be used for the lines The colours of the fill of the shape(s) The text style/font to be used.	**4**

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28(a)	***Two** from:* Reduction in file size/to reduce the file size… to make it fit in available/take up less space on storage device (Reduction in file size) to allow transmission in email (Reduction in file size) to allow faster download to webpage/loading of webpages Reduction in image resolution for display on small screen/mobile devices Glitch art can make use of compression artefacts to alter images/JPEGs for artistic displays/picture style.	2
(b)	**Six** from: Loss of image data has a visible effect on quality of image/image quality is reduced Compression artefacts are produced during process of compression/by compression algorithm Compression artefacts can be visible/noticeable and detract from/reduce image quality Sudden changes in colour/brightness/contrast in an image can cause rings/bands/ghosts can appear near the edges Conversion of a gradation in tone by loss of data into fewer tones causes blocking/posterisation/checker-boarding to occur False edges may be created/(false) contouring due to reduction of grey levels/reduction to less than 16 grey levels in image so more edges appear to viewer Loss of data in curves/combining curve data/pixels during compression can lead to the curve appearing stepped/stair-cased and not as a smooth curve (Degradation in quality due to) changes/reduction colour depth/saturation/hue Reduction in resolution Compression algorithms can mistake text in images and change the meaning e.g. 6 mistaken for 8.	6

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